SHL
WITHDRAWN
MEMORIAL LIBRARY
LOCK

CONSEIL PERMANENT INTERNATIONAL
POUR L'EXPLORATION DE LA MER

PUBLICATIONS DE CIRCONSTANCE

N° 1

Dr. C. G. JOH. PETERSEN

HOW TO DISTINGUISH BETWEEN MATURE AND IMMATURE PLAICE THROUGHOUT THE YEAR

A PRELIMINARY COMMUNICATION

WHIT 1 PLATE

EN COMMISSION CHEZ
ANDR. FRED. HØST & FILS
COPENHAGUE

JUILLET 1903

3. IX. 3

CONSEIL PERMANENT INTERNATIONAL
POUR L'EXPLORATION DE LA MER

PUBLICATIONS DE CIRCONSTANCE

N° 1

DR. C. G. JOH. PETERSEN

HOW TO DISTINGUISH BETWEEN MATURE AND IMMATURE PLAICE THROUGHOUT THE YEAR

A PRELIMINARY COMMUNICATION

WHIT 1 PLATE

EN COMMISSION CHEZ
ANDR. FRED. HØST & FILS
COPENHAGUE

JUILLET 1903

COPENHAGUE — IMPRIMERIE BIANCO LUNO

HOW TO DISTINGUISH BETWEEN MATURE AND IMMATURE PLAICE THROUGHOUT THE YEAR

A PRELIMINARY COMMUNICATION

(WITH 1 CHROMO-LITHOGRAPHIC PLATE)

BY

C. G. JOH. PETERSEN

For several reasons it would be desirable to be able to distinguish between mature [1]) and immature plaice throughout the year. For the study of the races [2]) it is necessary to compare mature fishes with mature ones and immature fishes with immature ones. During the summer it is excedingly desirable to determine the total length of mature fishes in the different seas. During the breeding time (the winter) this offers no difficulties as a general rule, because as I think, all mature plaice are breeding every year, but when we are not in or near the breeding season of the plaice, we shall not be able to see anything at all, neither on the testes nor perhaps on the ovaries. — Ernest W. L. Holt writes Journal Mar. Biol. Ass. vol. III (N. S.) p. 376, 1893—95 that in flat fishes it is always possible to see on the ovaries, if the fish has been spawning or not, for: „The really immature roe is short, plump & very firmly fixed . . . . . while in a fish which shows evidence of having spawned I have always found the roe wide and flaccid in front and nearly always extending further backwards along the spines than in the case of an immature roe." P. 377 he adds: „I must admit that the question is not absolutely judicially proved."

I am inclined to think that Holt is right in saying that the ovary of a plaice having been ripe once, never will show its former appearance of immaturity. Especially in the Baltic, where I have seen multitudes of old plaice during the summer and consequently at a

[1]) A fish is mature all its life when being or having been ripe.

[2]) With the word „race" I do not intend to distinguish between true hereditary races and such which are but apparently races i. e. such which in the first generation are only due to the surrounding conditions.

moment considerably later than the spawning time, I was surprised by seeing their large empty ovaries.

In this winter my assistants have examined a rather large number of plaice from the Cattegat in that respect; the preliminary result of this examination is that:

in all plaice with ripe eggs the ovary is longer than the head,
" " " " empty ovaries the ovary is longer than 88 % of the head,
" " " " unripe ovaries the ovary is shorter than 64 % and generally than 50 % of the head.

This certainly will be altered in the time of the spring and the summer. How much, is to be investigated. —

As long as the matter in question has not been better examined in all races for the ovaries and as long as we know nothing at all about the testes, it would be very desirable to know some *other features* by which we were able to recognize the maturity in a time far from the spawning season, at all events for the bulk of specimens.

It must be remembered that the size of the fish only affords us very little support with respect to this. In the Baltic a plaice may be mature at a length of 6 inches, but in the North Sea many plaice are not mature at 16—17 inches.

Cole & Johnstone (Liverpool Mar. Biol. Committee Memoirs. Nr. VIII. Pleuronectes [The Plaice] 1902) do not write anything about such features although they deal with many other things concerning the anatomy and the external characters of the plaice. Of recent authors, as far as I know, only G. Duncker (Wissenschaftl. Meeresuntersuch. Kiel. [N. F.] Bd. I, Heft 2. 1895) & later Cunningham discuss this question. Cunningham (Journal Mar. Biol. Ass. [N. S.] vol. IV) treats in detail the question about the races and mentions especially the spinulation of the scales. He writes that: „Duncker unfortunately overlooked the question of the age and maturity of his samples." Further he says: „that the spinulation of the scales is a character, with few exceptions confined to the mature males," and apparently he regards the spinulation as a normal feature for the males when they are mature — with few exceptions only. There is something about this, but how Cunningham really distinguished between mature and immature males during the time from September to November, he does not say and still this distinction is rather difficult at the beginning of this time.

Nevertheless he has shown that as a rule all large males are spinulated in the North Sea, and Duncker has shown something similar for the Baltic; here they are only stronger spinulated. Holt also in the later years mentions spinulated plaice, but he has not examined

a greater number of specimens. I can tell, that at Iceland the male plaice is also spinulated. In the spinulation we thus possess a character, which has something to do with age and maturity.

CUNNINGHAM (loc. cit. p. 324) says: „The development of spinulation does not always correspond exactly to the attainment of maturity, although it does so usually."

It is possible to enter more into details with respect to the examination of the degree of spinulation. For the Cattegat-Plaice this has already been done this winter by one of my assistants. The result is: *that when the true operculum is spinulated to such a degree that most of the spinulated scales possess 2 or more spines, the fish, as a rule, is mature.*

Before this degree of spinulation is reached, the head and other parts of the fish are already spinulated; but such particulars are not to be given here. 25 immature plaice had no spinulation or only a very low degree of spinulation on the operculum, 25 mature specimens showed spinulation as mentioned above, and only 5 mature ones had but a few spinulated scales bearing two or more spines on the operculum. In the degree of spinulation we thus as a general rule possess a good character to distinguish between mature and immature males, but I know that the different races do not correspond exactly in this point. This is to be investigated in the future.

The females are so rarely spinulated that this character is of little or no value in distinguishing the mature from the immature ones.

However we possess another character, which in both sexes can be used for the majority of specimens to separate mature from immature fishes. This character is the white or pale circles which are to be seen around the orange spots, as well on the fins as on the body. The pale circles are especially conspicuous in old large fishes which have been breeding one or several times, giving them in connection with their bad condition a peculiar habit. (Pl. I, Fig. 2 compare Fig. 1.)

The earlier authors as FABER, GOTTSCHE, KRÖYER and NILSSON have all of them discussed the question if such plaice belong to a distinct species *Pleuronectes borealis* closely allied to *Pleuronectes platessa*. Our Danish fishermen have given several names to these fishes, which are bad as an article of food, e. g. „Hanser" or „Præsteflydre" viz. „Flounders for the priests". Apparently the last name was given them because they were large fishes and therefore good to give to the priests who were not presumably able to see that they, owing to their leanness, were rather bad to eat.

F. FABER (Isis 1828) mentions the *Pleuronectes borealis* or *Præsteflynderen* from the Cattegat as a separate species. GOTTSCHE (Wiegmanns Archiv, 1835, II) reduces this species to a variety of *Pleuro-*

nectes platessa. The characters, by which the Præsteflyndre are distinguished, are, as it was to be supposed, only of very little systematic value, and KRÖYER (Danmarks Fiske, II Bd., 1843—45) therefore gives some critical remarks and says (l. c. p. 268): „I am inclined to think that it is the fishermen in the Northern Cattegat, especially from Hirsholmen, who have given FABER the idea, that the Præsteflynder or Hanse is a species different from the plaice . . . . . But in supporting this view they (the fishermen) only mention the size, that the usually dark colour here is less dark, the spots somewhat different, and especially that the Præsteflynder in its value as food & consequently also in price is inferior to the plaice." KRÖYER further (p. 269) says: „The Præsteflynder is therefore, as fas as I can see in the same relation to the plaice as the great cod or the cabliau to the „Taretorsk"; they are not distinct species but forms of the same species. But if anybody asks if the Præsteflynder is bred in and always lives in deep water, or if the plaice when it grows older and alters its dwelling-place becomes a Præsteflynder, I do not know it certainly. I only want to say this, that I never saw a young fish of the latter form."

At all events both the fishermen and the earlier authors have seen a form of the plaice being of a large size (never small) and possessing peculiar orange spots „circumscribed by pale circles", (KRÖYER) and being of less value as an article of food. The quoted authors also mention another form of the plaice (*Pleuronectns pseudoflesus*) but here I shall not enter more on this form.

My own investigations have shown that the pale circles do not appear exactly at the time of first maturity, they may also be present in immature specimens and are sometimes not to be seen in mature ones. They do not appear at once or suddenly and are in some cases conspicuous, in others nearly invisible. I have examined plaice in the Cattegat during their breeding season and found that all older fishes as well as far the most of the breeding ones possess such circles. For the North Sea I can say nothing exactly about this matter, but no doubt the *Pleuronectes borealis* of the earlier authors is only older mature specimens and consequently not a race but only the quite normal, grown up plaice. The form in question, *Pleuronectes borealis* is met with from the Baltic to Iceland.

It is significant that whilst investigating the plaice in the Baltic, I first got the exact knowledge with this form. The reason is, that at the present time, the „Præsteflynder" is not so common in the Cattegat, as when FABER lived, because, as I have otherwise shown, the old fishes here have been fished up; in the Baltic, where the race is of a small size and the fishes become „Præsteflyndre" at a size smaller than the size-limit of the Danish law for saleable fish i. e.

about 10 inches, the older ones are not fished up because fishing does not pay for such small fish. In the Baltic the plaice may become a „Præsteflynder“ at a length of about 6—7 inches, the large size thus being not characteristic for the *Pleuronectes borealis* = the mature fish.

When the plaice is not in or near the breeding time we therefore are only able to distinguish betwen mature and immature specimens by means of the following characters:

Mature fishes possess, as a rule, pale circles round the orange spots over the whole body. In the males most of the spinulated scales of the true operculum possess two or more spines (in the Cattegat).

The females perhaps always show „the roe wide and flaccid in front“. —

I regret not to be able to give better or more settled data in this matter but in considering the importance of the question, I thought it useful to lay before the Council what I know and what I do not know concerning this matter hoping that during the present breeding season of the plaice we shall get our knowledge supplied by new investigations all over the North Sea.

EXPLANATION OF PLATE I

Fig. 1. An immature plaice ♀ without pale circles, caught in the Cattegat January 1903, length circa 33 cm.

„ 2. A mature plaice ♀ with pale circles, caught in the Cattegat January 1903, „Var." borealis, length circa 40 cm.

(Both figures are $^{10}/_{32}$ of the natural size.)

Gen. Stab. Lit. Anst. Stockh.

Pleuronectes platessa, L.